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The Effects of Competition and Perceived Pressure on Performance of a Visual Scanning Task: A Test of Cognitive Evaluation Theory

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THE EFFECTS OF COMPETITION AND PERCEIVED PRESSURE ON PERFORMANCE OF A VISUAL SCANNING TASK: A TEST OF COGNITIVE EVALUATION THEORY

by

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Abstract

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Cognitive Evaluation Theory was developed by Deci & Ryan, (1985) to explain factors that affect intrinsic motivation. This study was done to test this theory by having volunteers engage in direct and indirect competition while working on a simple task in a time-pressured environment. Specifically, it was predicted that task performance would be adversely affected in competition because participants would be focused on the outcome (winning versus losing), while being faced with a deadline for task completion. In addition, a reduction in intrinsic motivation toward the activity was expected. While these hypotheses were not supported, a proposal was made that certain environments may result in people becoming accustomed to competition and/or pressure, which would explain why this outcome occurred. In addition, females performed better and reported higher levels of intrinsic motivation, which is inconsistent with previous research.

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Introduction

The study of motivation consists of two parts, the energy and direction of behavior (Deci & Ryan, 1985). People are motivated to act when a need arises that must be satisfied (energy) and how they interact with their environment to satisfy that need (direction). Theories of motivation fall into two main classes, mechanistic and organismic. In mechanistic theories of motivation, we are seen as passive organisms that are merely pushed around by the effects of physiological drives and we simply react to them as they occur. We feel hungry, so we interact with our environment to find food. Organismic theories view humans as more active in that we actually initiate behaviors, and look for opportunities in the environment to satisfy our needs.

Theories of Motivation

The first theories dealing with motivation were called drive theories. Sigmund Freud was one of the earliest proponents of these theories, in which he claimed that all behaviors were motivated directly by a physiological drive, such as hunger and thirst. This line of thinking continued through the early forties as the basic drive theory was modified, but it was still unable to account for why both people and animals actively explored new environments and engaged in new experiences for no particular reason, other than the pure enjoyment of doing so (Deci, & Ryan, 1985).

This realization led to the concept of intrinsic motivation in 1959 (White, 1959). Intrinsic motivation is defined as motivation to engage in an activity for its own sake, without the promise of a reward for doing the activity (Enzle & Ross, 1978; Bumpus, Olbeter, & Glover, 1998). On the other end of the spectrum is extrinsic motivation, which is motivation derived from the tangible rewards that are obtained for doing a task. More often than not, an externally motivated

behavior is one that a person has been pressured into doing, and even if the behavior was initially done for the simple pleasure of doing it, once a person is required to do it, the intrinsic interest in the activity diminishes (Deci, Betley, Kahle, Abrams, & Porac, 1981).

Self-determination theory grew out of this understanding. This theory focuses on three specific needs, which are competence, relatedness, and autonomy. Competence involves a feeling of doing a task well, relatedness is being able to have meaningful relationships with others, and autonomy is having the freedom to make decisions and take control over our actions (Deci, Vellerand, Pelletier, & Ryan, 1991). When encountering a new situation, a person goes through a process of internalization, in which he or she examines the environment to see if the three needs listed above will be met. If the opportunity to be self-determining is present, intrinsic motivation is enhanced and when self-determination is removed from a situation, intrinsic motivation is reduced. If a total loss of control is determined, the person may experience amotivation, which is similar to learned helplessness. In this condition, a person's ability to function in that environment can be severely impaired (Deci & Ryan, 1985).

Cognitive evaluation theory is an extension of self-determination theory. According to cognitive evaluation theory, any reward has two basic functions. The first is the control of behavior, since the person must engage in the task to receive the reward. The second is informational, since it provides feedback for how well a task is being done, and implies competence in the task (Enzle & Ross, 1978). What is important is that a person may behave differently depending on which of these two aspects seem most salient at the time. If a task is done specifically to obtain a reward, the person will feel a reduced sense of autonomy and intrinsic motivation will decrease. However, if the focus is on the informational aspect of the task and the feedback is positive, intrinsic motivation will increase. If the feedback is negative,

the person may show a decrease in intrinsic motivation if they feel they cannot improve, or intrinsic motivation could increase if they feel they can get better through practice (Ryan, 1982; Frederick & Ryan, 1995).

This is just a brief history of how theories of motivation have changed since the early 1900s. The next section will examine intrinsic motivation in more detail by looking at what factors cause intrinsic motivation to change and why.

What Factors Affect Intrinsic Motivation?

Intrinsic motivation, or engaging in an activity for its enjoyment value, is one of the most powerful forms of motivation (Bumpus, Olbeter, & Glover, 1998). However, several factors act to reduce intrinsic motivation. While some factors are situational, such as imposed deadlines on performance of a task (Amabile, DeJong, & Lepper, 1976), surveillance, and evaluation (Deci & Ryan, 1985), many studies have focused on the presence of a tangible reward and the effect it has on intrinsic motivation for a variety of different situations, involving both children and adults.

Before 1971, hundreds of studies were conducted concerning the effects of reward on behavior and the overall conclusion was that if a reward was given after a certain behavior had occurred, the behavior would be repeated (Deci & Ryan, 1985). However, once the reward was no longer given, the behavior would eventually stop. This research led to the use of rewards as a motivational tool in a wide variety of situations, mainly in the workplace and the classroom (Deci, Koestner, & Ryan, 1999a; Ambrose & Kulik, 1999; Cameron, Banko, & Pierce, 2001).

In 1971, Deci expanded on the research of White (1959) and questioned how the presence of a reward would affect an activity that was intrinsically motivated, and discovered

that the reward would actually undermine a person's motivation to participate in an activity that was once enjoyable to him/her (Deci, Koestner, & Ryan, 1999a). This included not only tangible rewards, but verbal rewards (positive feedback) as well (Shanab, Peterson, Dargahi, & Deroian, 1981). This finding was important since it was the first evidence that desired outcomes such as rewards could actually have a negative impact on performance, which is contradictory to what most people would believe to be true. This led to hundreds of studies being conducted in an attempt to replicate these findings and has resulted in a continuing debate over the effects of rewards on intrinsic motivation.

Rewards and Intrinsic Motivation-The Debate Continues

Because of the large number of research studies done on this topic, the debate has carried on through the publication of several meta-analyses, with three being published from 1988 to 1995, which supported the idea that rewards decreased intrinsic interest as explained by cognitive evaluation theory. In response to this, Eisenberger and Cameron (1996) replied with another meta-analysis and concluded that this was not the case. They reported that detrimental effects of rewards occurred only under highly restricted, easily avoidable conditions and that classical and instrumental conditioning were better able to explain both the positive and negative effects of rewards on behavior, not cognitive evaluation theory. Their article criticized the findings of an earlier study by Cameron and Pierce (1994) and pointed out flaws in their analysis, which supported the argument of the negative effects of rewards (Deci, Koestner, & Ryan, 2001). According to the Eisenberger and Cameron analysis, the only negative effects of reinforcement occurred when the amount of free time spent performing a task is assessed after an

expected reward has been given with no regard to the quality of performance (Eisenberger & Cameron, 1996).

In response to this, Deci, Koestner & Ryan (1999a) performed another meta-analysis examining the results of 128 experiments and organizing them with respect to cognitive evaluation theory. This analysis supported the notion that tangible rewards do significantly undermine intrinsic interest and they also provided an appendix listing all of the studies examined by Cameron & Pierce explaining where errors were made in their analysis, as well as describing in detail why the conclusions made by Eisenberger and Cameron were incorrect.

The main difference in the Deci et al. study was that they did not separate studies based solely on expected or unexpected tangible rewards, but instead subdivided expected rewards into four separate categories. These were task non-contingent rewards, which are rewards given without specifically requiring the person to engage in the activity; engagement-contingent rewards, or rewards offered to participants for engaging in a task without having to actually complete it; completion-contingent rewards in which completing the task is required; and finally performance-contingent rewards, in which the amount of reward is dependent on the person's level of performance (Deci, Koestner & Ryan, 1999a; Cameron, Banko, & Pierce, 2001).

In addition to this, Deci, Koestner & Ryan published a paper in 1999, which was a reply to two analyses done by Eisenberger, Pierce & Cameron (1999), and Lepper, Henderlong, & Gingras (1999). The first of which pointed out the pitfalls to look out for when conducting a meta-analysis, while the latter discovered a new finding that when people are told that their performance will be evaluated by high standards their intrinsic motivation is reduced more when they do not get rewards than when they do. This article also concluded that cognitive evaluation

theory was the best-supported and most comprehensive theory explaining the effects of rewards on intrinsic motivation (Deci, Koestner, & Ryan, 1999b).

The debate continued to intensify in 2001 with the publication of a meta-analysis done by Cameron, Banko, & Pierce. They reviewed some of the earlier analyses, pointing out why they believed these analyses to be incorrect. They conducted their own analysis of 145 studies, including unpublished studies (doctoral dissertations), and they separated the studies based on whether a free-choice or self-report measure of intrinsic motivation had been used as Deci, Koestner, & Ryan, (1999a) had done in their analysis.

Their overall conclusion was that giving rewards did not have a detrimental effect on intrinsic motivation, but they did also say that this finding should be taken with caution, since rewards have different effects under different moderating conditions. They point out that rewards have the greatest positive impact when given to enhance performance on tasks that initially are not enjoyable, and that by giving rewards interest in the activity can be enhanced, especially in academic settings. They also found that rewards offered for attaining a criterion of performance are tied to mastery of that activity, which causes people to report more interest in the task, especially when rewards are given for exceeding the performance of others. According to these findings, they believe that cognitive evaluation theory would have to be modified to be able to explain these positive effects of rewards due to level of performance on a task and that rewards can increase perceptions of self-determination (Cameron, Banko, & Pierce, 2001).

To summarize, much research has been done on the impact of tangible rewards on intrinsic motivation. Through the publication of several meta-analyses, researchers have continued to debate whether there is a negative or positive effect or none at all, which has varied depending on what factors are being analyzed, and how the data is interpreted by the people

publishing the study. However, the majority of researchers do agree with the views of Deci, Koestner, & Ryan, that a reward given after completion of a task will undermine intrinsic motivation, which is one of the key elements of the cognitive evaluation theory.

Cognitive Evaluation Theory-An Overview

Cognitive evaluation theory is made up of four propositions (Deci & Ryan, 1985; Kristjansson, 1993).

Proposition I explains how different situations affect intrinsic motivation. It describes two ways in which interest in an activity can be changed. It states that if a person is doing an activity that they find enjoyable, and then are forced to continue to engage in that activity through some type of external pressure, intrinsic interest in the activity will decrease. However, if a person is doing something because he or she likes doing it, and something occurs results in further enjoyment or interest in the activity, then motivation to continue doing that activity will increase.

Proposition II explains the association between perceived ability and intrinsic motivation. It states that when someone is engaged in a moderately difficult task, their enjoyment of the task will be influenced by how competent they feel they are, and how well others around them think they are doing. If positive feedback is given, and the person feels relatively competent in the task, intrinsic motivation will increase, but if negative feedback is given, the person will feel less competent in their abilities, and intrinsic motivation will be reduced.

Proposition III names three circumstances that affect a person's interest in an activity, and depending on which of these three is most important at that time, explains how intrinsic motivation will be affected. The first of the three is the informational aspect. This means that

the person is engaged in the activity because they like doing it and know that they are good at it, which leads to an increase in intrinsic motivation. The second circumstance is called the controlling aspect. This means that a person is doing a task only because other people want them to for one reason or another. This leads to a decrease in intrinsic motivation. The final aspect is the amotivating aspect. This means that a person believes that doing the task is beyond his or her control. This loss of self-determination leads to a decrease in intrinsic motivation.

Proposition IV is very similar to proposition III. The only difference lies in from where the pressure comes. In this proposition, pressure to succeed is internal, meaning that it lies within the person. This proposition is concerned with how people think of themselves based on their own experiences. When people put pressure on themselves to do well at a task, intrinsic motivation is reduced toward that activity. If there have not been enough experiences in the past from which the person can draw upon, motivation toward the activity can be changed by observing how well the individual's performance stacks up to those around him/her. This falls back on the competence issue discussed in proposition II.

While previous theories of motivation focused solely on the external event, such as a reward, and how motivation was affected, cognitive evaluation theory is the first to examine how a person's perception of the event leads to a change in motivation. Individual differences in how an event is perceived will lead to different motivational responses for different people, depending on which part of the experience is most salient at that time (Deci & Ryan, 1985).

The difference lies in whether the person has an internal or external locus of causality toward the task they are doing (Deci, Koestner, & Ryan, 2001). Intrinsically motivated behavior that is done for enjoyment or mastery of a task has an internal locus of causality. If a person engages in an activity because of an external constraint, such as pressure or rewards, then he has

an external locus of causality. When a reward is given for doing a task that was initially intrinsically motivating for an individual, a shift in locus of causality will be evident as focus changes from doing the task for enjoyment to doing it to receive the reward.

While monetary rewards are used in many studies, other studies have demonstrated this shift in locus of causality for several other types of rewards, such as toys, food, good-player awards, and certificates of achievement (Cameron, 2001; Deci, Koestner, & Ryan, 2001). While the presence of the reward is essential for a reduction in intrinsic motivation to be seen, two factors must be considered. First, the reward must have salience to the person doing the activity. For example, giving candy to workers at the end of the week as payment would not motivate them as much as a cash bonus for getting the job done on time, but candy would be an effective motivator for children to try to get the most questions right on a test. Second, the reward will only undermine intrinsic motivation if it is expected for completing a task. Knowing in advance that a reward will be given is what leads to the shift in locus of causality from internal to external. This is because it is the dependence on receiving a reward that causes people to perceive it as controlling their behavior (Deci, Koestner, & Ryan, 2001).

Studies Testing Cognitive Evaluation Theory

Several studies have been done to attempt to replicate these findings. One of these, conducted in 1978 by Enzle & Ross, examined the effects of contingent rewards on intrinsic task interest, but was expanded to look at the effects of different levels of reward value on motivation. The researchers were trying to see if a smaller reward influenced motivation differently than a bigger one. Subjects were told at the beginning of the study that receipt of payment ($.45 low, $1.50 high) for completing the task did not depend on quantity or quality of output, but that

rewards would be given simply for working on the task, which in this case were soma puzzles. In addition, some of the participants were told they would receive the reward before they began the task, while others were rewarded unexpectedly.

The results of the study provided support for cognitive evaluation theory, in that rewards can either increase or decrease intrinsic motivation depending on which aspect of the reward is made salient. The same high-value reward decreased intrinsic interest when participants knew ahead of time that they were going to receive it (task-contingent), but increased intrinsic interest when receipt of the reward meant that they had performed the task well (criterion-contingent).

A second study examined the effects of feedback on intrinsic motivation, since verbal feedback had been shown to both increase and decrease intrinsic interest in an activity, depending on whether the person receiving the feedback interpreted it as controlling or informational. The more we experience what someone says as pressure to achieve a particular outcome, the less likely we are to be intrinsically motivated to do that activity, but verbalizations that do not imply pressure or convey positive information are more likely to increase intrinsic motivation. The difference in this study was that the feedback was either self-administered or provided by the experimenter concerning performance on a series of hidden figures (Nina) puzzles (Ryan, 1982).

This study found that intrinsic motivation was significantly less for subjects receiving controlling as opposed to informational feedback, for both self-administered and experimenter-administered feedback. In addition, a distinction was made between those subjects who were task-involved or ego-involved. When someone is task-involved, the motivation to engage in an activity is intrinsic and is created through task interest, challenge and novelty, while someone who is ego-involved is externally motivated to engage in the activity. This study found that

subjects who were ego-involved were significantly less intrinsically motivated than subjects in the task-involvement condition were. The interaction between informational feedback and task involvement produced the greatest level of reported intrinsic motivation on a post-experimental questionnaire. All of these results provide support for cognitive evaluation theory (Ryan, 1982).

Finally, a third study, conducted in 1990 by Rummel & Feinberg examined the fact that people approach a task with different levels of intrinsic motivation, and that a clearer understanding of this variation may help explain why controlling feedback has a negative impact on intrinsic motivation. These researchers believed that this could better be explained by expanding cognitive evaluation theory to include reinforcement theory, which states that a behavior will increase in strength and frequency when it is rewarded.

The study was done by having subjects complete several questionnaires including a motivational orientation and locus of control scale. These were used to separate the participants into groups before they were asked to solve soma puzzles. After the completion of each puzzle, subjects received feedback that was either controlling or informational. Then they were left alone in the room for eight minutes while being watched through a one-way mirror. This was done to measure the amount of time participants worked the soma puzzles during a free-choice period.

Results indicated that people who were reinforced consistent with their expectations (given positive feedback after solving the puzzles) showed an increase in their behavior. In addition, intrinsically motivated people who received intrinsic rewards showed the highest amount of motivation toward the task as measured by the free-choice period, while extrinsically motivated individuals receiving intrinsic rewards, which were inconsistent with their expectations, spent the lowest amount of free time solving the puzzles. This research showed the

importance of considering a person's primary motivational orientation when administering rewards for behavior on a task, since differences in orientation would cause people to react to the rewards differently (Rummel & Feinberg, 1990).

Competition and Intrinsic Motivation

Edward Rudow and Jacob Hautaluoma conducted one of the earliest studies looking at the effects of competition on performance in 1975. They were examining how competition plays a role in educational settings to determine whether competing with others enhanced or degraded performance. Two competition conditions were used in this study, one being direct competition with another person, and the other being competitition with self. The results were that competition led to a greater quantity of work output than non-competition conditions, but also resulted in a higher number of mistakes than those not competing. The conclusion drawn by these researchers was that if quality of production is important, a setting should be created that allows for competing with one's own best performance and not putting people directly against each other. However, if errors need to be minimized, competitition should be avoided.

Many studies have been done since this one and have been expanded to look more closely at the effect of competition on intrinsic motivation, especially since competition has been used in many different settings in an attempt to increase motivation (Kohn, 1986). While we are most familiar with competition in sports, it has become commonplace both in the classroom and the workplace as well.

As has already been explained, intrinsic motivation is negatively affected by any aspect of a situation that may be perceived as controlling by the people involved. The question that needed to be answered was whether people would view beating someone else as a reward for

engaging in an activity and if this focus on winning would have a negative impact on performance (Kohn, 1986; Vansteenkiste & Deci, 2003).

In a 1981 study done by Deci, Betley, Kahle, Abrams, and Porac, participants solved soma puzzles in the presence of a same sex confederate and were either told to try to beat the other person or just try to do your best. After completing the first phase of the experiment, subjects were left alone in a room with additional soma puzzles made available to them. During this "free choice" period, the amount of time that the participants worked on these puzzles was measured as an indicator of intrinsic motivation to continue the task. The results of this experiment found that subjects in the perceived competition condition spent less time working on the puzzles during this period than those that were not competing. This supported the theory that people in competitive situations viewed winning as a reward for engaging in the activity and since it is external and dependent on performance, intrinsic motivation for the activity was reduced.

Two related studies were conducted by Vallerand, Gauvin, and Halliwell, done in 1986. In the first of these studies, Vallerand and his colleagues examined zero-sum competition, in which several people compete for only one prize, such that there can be only one winner and everyone else loses. In this experiment, 10-12 year old children competed on a stabilometer for a prize of one dollar if they had the best performance compared to the other children. According to the results, the students who lost the competition perceived themselves as less competent at the task according to their responses on a post-test questionnaire and spent less time using the stabilometer during a free-choice period than those students who won the competition (Vallerand et al., 1986a).

In the second study, children from the same population were used as in the earlier experiment, but the students were divided into a competition condition, in which the goal was to beat the time in balance (TIB) scores of the other children, and a second condition labeled the intrinsic mastery orientation condition. This group of children were not given specific instructions for using the stabilometer, but were told to come up with as many new ways to maintain balance while trying to perform as well as possible. In other words, the main difference between the two conditions was that the children in the competition condition were specifically trying to beat the times of their peers, while those in the intrinsic mastery condition were trying to discover new ways to approach an interesting and novel task (Vallerand et al., 1986b). Following the experimental trials, children in both conditions completed a questionnaire on perceived competence and participated in a free-choice period as in the previous experiment.

The results of this study were consistent with those of the first in that the children in the competition condition who were told they lost the competition spent less time on the stabilometer than those who were told they were the winners. In addition, it was found that all children in the competition condition (whether they won or lost) spent significantly less time engaging in the activity during the free-choice period as those in the intrinsic mastery condition. However, the results of the competence measure were the same across the two groups.

One final study examined how perceived pressure affected intrinsic motivation in a competitive situation (Reeve & Deci, 1996). In this experiment, participants were paired up with a same-sex confederate and asked to solve wooden cube puzzles. Each person was asked to solve six puzzles; two for practice and the other four were the performance puzzles. The confederate always allowed the subject to complete the first practice puzzle before he or she did,

but solved the second one faster. This was done to make the two competitors seem equal in ability.

In the non-competitive conditions, the subjects were asked to "just do your best", while in the competition conditions, the goal was to try to beat the other person by solving the puzzles faster. In addition, the experimenter kept emphasizing that the participant should focus all of his or her attention on being the winner in a "pressure to win" condition. Following the puzzle-solving part of the experiment, each participant was left alone in the room with some previously used puzzle configurations as well as some that had not been used during the experiment. The behavioral measure of intrinsic motivation was the amount of time each person spent working with the new configurations during a 5-minute free-choice period. These researchers believed that the time spent with the new puzzles was a better index of intrinsic motivation since it is defined as the willingness to seek out new challenges (Reeve & Deci, 1996).

The results of this study were that all participants in the competitive conditions reported less self-determination than those not competing. For the competitors, perceived competence was higher for the winners than for the losers. In addition, the winners played with the new puzzle forms more than the losers did, and competitors not pressured to win spent more free-choice time working the new puzzles than those who were pressured to win. Losers were more apt to play with the previously encountered puzzles than were the winners (Reeve & Deci, 1996).

Competition and Individual Differences

In the previous sections, several factors have been discussed that influence whether or not someone is more likely to be impacted motivationally by competition. This section looks at different individual characteristics that may relate to an increased competitiveness in a person.

These include personality-based competitiveness, need for achievement, anxiety level, and gender.

Personality differences

Competitiveness as a personality trait has led to the classification of an A and B type personality. A-type people are considered to be those who seek out competition in most aspects of their everyday life, exhibit high achievement motivation, and are pressured by time, always hurrying from one task to another. People classified as being type A individuals are more prone to several health problems such as heart attacks and stroke. B-Type persons are those who are more relaxed and exhibit few, if any, of the qualities mentioned above (Fulop, 2002).

People who have a high need for achievement tend to work longer on a task following failure and show more task persistence for hard tasks as compared to easy ones. In contrast, people who have a low need for achievement show reduced persistence to completing a task after an initial failure, but do react positively to encouragement or success. Looking at these differences, it is predicted that people at both ends of the spectrum would show increased intrinsic motivation after receiving positive information concerning competence at the task, but those with a high need for achievement would show an even higher increase in intrinsic motivation after receiving negative competence information (Epstein & Harackiewicz, 1992, Tauer & Harackiewicz, 1999).

Anxiety was operationally defined by Reeve, Olson, & Cole (1987), as "evaluation apprehension". They hypothesized that highly anxious people would be most apprehensive in situations involving the evaluation of task competency where failure is experienced, most notably in competitive situations. When encountered with these situations, there would be a significant reduction in intrinsic motivation for these people. Low anxious persons would view

competitive situations more favorably, since they do not tend to focus on the evaluative nature of competition, and would not show this reduction in intrinsic motivation.

Gender

The common view with respect to competition and gender is that males are more competitive, while females are more cooperative in nature (Ahlgren, 1983). In fact, competitive behavior is rewarded more often when displayed by young boys, while girls are rewarded for cooperating when playing with other children. The following experiment was designed to examine these differences (Weinberg & Ragan, 1979). In this study, three levels of competition were used, direct (face-to-face), indirect (competition against a standard), and a no competition control group. The researchers were attempting to see which groups displayed more intrinsic motivation and whether gender was a factor.

What was found was that males displayed significantly more intrinsic motivation in competition than when not in competition, while females showed no difference between these two conditions. Also, males tended to adopt a style that was more assertive and status oriented while females were more affiliative in nature (Weinberg & Ragan, 1979).

A second study was done to examine the effects of positive and negative performance feedback on intrinsic motivation with respect to gender (Shanab et al, 1981). In this experiment, participants were asked to complete a series of soma puzzles and were given either positive, negative, or no feedback concerning their performance on the task. Then each person was observed during a 10-minute free-choice period in which he or she was left alone with two additional soma puzzles, and some magazines. The second experimenter recorded the amount of time the participants chose to work on the soma puzzles during this period.

The results of this study failed to support earlier studies in which an interaction between type of feedback and gender was obtained. Both the positive and negative feedback groups spent considerably more time working with the soma puzzles during the free-choice period than did the control groups regardless of gender. This discrepancy was explained by the socialization process, which means that how women perceive feedback based on their performance has changed due to the changing role of women in society since the earlier studies were conducted. In addition, to explain the finding that negative feedback did not affect intrinsic motivation as expected, the researchers concluded that the feedback used in this study was not harsh enough for the subjects to perceive it as negative (Shanab et al., 1981).

Another study examining the effect of positive and negative feedback on performance with respect to gender was conducted in 1988 by Kast and Connor. In this study, children in third, fifth, and eighth grade solved word search puzzles while receiving either positive, negative, mixed, or no feedback from the experimenters. Contrary to the study mentioned above, this study confirmed previous results obtained with adults that feedback seen as controlling would reduce overall intrinsic motivation, while informational feedback would increase it regardless of gender. However, females reported lower intrinsic motivation than males for all feedback conditions, which was explained by these researchers as showing the differences in socialization between genders from a young age (Kast & Connor, 1988).

What has also been discovered is a shift in girls' competitive behavior as they approach adolescence (Ahlgren, 1983). This research showed that adolescent girls tend to withdraw from openly competitive situations and has been called "fear of success". What may be happening is that they revert to what was originally taught to them as children, that competition is not feminine, and it occurs because it is more socially acceptable (Kohn, 1986; Fulop, 2002).

Sports and Competition

Sports are a large part of our culture. There are several reasons someone may choose to participate in sports, and most of these reasons are intrinsically motivated. Initially, when first learning a new sport, the novelty and excitement are enough to motivate continued participation. However, once skills improve, there may be a shift in focus, from just participating for fun and fitness to competing against others to see how competent we have become. This shift leads to participating in the activity for extrinsic reasons rather than intrinsic ones. According to cognitive evaluation theory, this shift from an internal to an external perceived locus of causality will result in reduced intrinsic motivation for that activity (Deci & Ryan, 1985; McAuley & Tammen, 1989).

A study done in 1995 replicated these findings with respect to goal perspective theory, which states that personal goals affect how people think, feel, and act in situations such as sports where achievement of a certain objective, such as winning, is important. This leads to the person becoming more ego involved, which is being motivated to do something in an effort to increase self-esteem (Frederick & Ryan, 1995). The opposite of this is task involvement, where a person is focused more on the process to the goal instead of the goal itself (Duda, Chi, Newton, Walling, & Catley, 1995).

According to goal perspective theory, whether or not a person is ego or task involved depends on two things, environmental factors and individual differences. Most of the research done on goal perspective theory dealt with academic settings, so those studies reported factors such as social evaluation, feedback, and testing of important skills to lead people to become more ego involved, while situations that emphasized the importance of learning and personal

improvement resulted in a state of task involvement. As mentioned earlier, ego involvement is related to high extrinsic interest, while task involvement is intrinsic in nature.

Research has supported both the predictions of goal perspective theory and cognitive evaluation theory with respect to a sports scenario. The students who were involved in sports that were high in task orientation tended to enjoy the sport more and show more interest in the activity as scored on the intrinsic motivation inventory as compared to students who were ego oriented. In addition, high task oriented students reported that they worked hard to play well and that participation in the activity was important to them (Duda, et al., 1995).

One study in this area assessed the effects of subjective and objective competition on intrinsic motivation following completion of a one-on-one basketball jump-shooting competition (McAuley & Tammen, 1989). The participants in this study were undergraduate college students enrolled in a mandatory physical education class. The experiment was done by placing the students in pairs and having them participate in a competition similar to the game of horse. Following the competition, the students completed a revised post-experimental intrinsic motivation inventory and a measure of perceived success. Objective outcome was classified by whether the participant actually won or lost the competition, and subjective outcome was classified based on the perceptions obtained by the success measure mentioned above. The combined scores for this measure were equally divided and categorized as either high or low.

The researchers hypothesized that perceptions of personal success would influence intrinsic motivation more than whether the person actually won or lost the competition. A second area of interest was how subjective and objective outcomes would affect the components that underlie intrinsic motivation as measured by the Intrinsic Motivation Inventory (Ryan,

1982), mainly the perceived competence, effort, interest/enjoyment, and pressure/tension subscales.

The results of this study were that the above-mentioned subscales failed to differentiate between winners and losers in the competition phase of the experiment. What did occur was that those students who perceived their performance as good reported higher overall intrinsic motivation for the task than those who reported a lower subjective outcome. This shows that it is more than just winning that results in increased intrinsic motivation, but perceptions of performance can have an effect as well (McAuley & Tammen, 1989).

Another study examined the relationships among social factors, individual differences, intrinsic motivation, and effort in a physical education context (Ferrer-Caja & Weiss, 2000). This study is important because it looks at not only the activity itself, but also the motivational climate and teaching styles that are present in the environment as well.

Students used in this study were participating in a required physical education course. The researchers had the students complete several inventories to achieve an index of motivation, perceived competence, goal orientation, motivational climate, teaching directiveness, and intrinsic motivation. These questionnaires were administered at both the beginning and the end of the school term to allow students time to make accurate judgments of the environmental factors of class climate and the teacher's style.

As expected, students who perceived their class as higher in learning climate reported higher levels of task orientation, perceived competence, and self-determination. These students also reported that their teachers were more encouraging and allowed them to participate more in decision making for class activities. The students who perceived a stronger performance climate that promoted competition reported higher levels of ego orientation and reduced intrinsic

motivation, which correlated with lower reported enjoyment in the class (Ferrer-Caja & Weiss, 2000).

These studies show that no matter whether the sports activity is done by adults or children, there are several factors that can lead to a shift from enjoyment to reduced motivation to participate as proposed by cognitive evaluation theory.

Competition in Educational Settings

Another area where competition is prevalent and when cognitive evaluation theory has been tested is in academics. Children learn from a very young age that the student who gets the highest score on a spelling test is recognized and the best artwork is placed on the bulletin board. This continues to intensify all the way through high school, where there is a growing emphasis on grades received, especially if the student is interested in going on to college. This increases social comparison and competition among the students, which can lead to detrimental effects on learning processes (Fulop, 2002).

Further support for this argument comes from two studies concerning the performance of students while working in both competitive and cooperative situations. In 1979, Johnson, Johnson, & Skon conducted a study in which students were placed in one of three conditions, either competing with another student, working cooperatively on the task, or working individually. The results were that in all six tasks measured, students working in the cooperative condition achieved better performance than the students in the competitive conditions did. These students also reported that the tasks seemed easier when working cooperatively with another student than when competing or working alone.

The second study, done in 1982, expanded on these results by looking at locus of control on achievement in both cooperative and competitive situations (Nowicki, 1982). Locus of control is determined by whether or not a person perceives a connection between how much effort is put into a task and a reward that may be given for completing it. If people do see a connection between behavior and reinforcement, they are called internals. However, if the person views reinforcements as the result of luck, fate, or some other outside source, they are termed externals (Nowicki, 1982).

His hypotheses were that since internals depend primarily on themselves for reinforcements, a competitive situation would result in greater effort toward the task, while a cooperative situation would result in lowered performance for internals because there is now a shared responsibility for task completion. Externals would not be affected either way by competitive or cooperative learning situations since they perceive themselves as unable to change the outcome.

The results of this study were very interesting with respect to education. Nowicki found that internals performed better than externals in a competitive situation, but not in a cooperative situation. While he predicted that internals would be more apt to change their performance with respect to the situation, this was not what occurred. Their performance was consistent in both conditions, while the performance of the externals was inconsistent. When externals were confronted with a cooperative learning situation, their performance was comparable to the internals. In addition, the performance of the externals in cooperative learning conditions was significantly better than externals in the competitive conditions.

In addition, externals will show low levels of intrinsic motivation following both positive and negative feedback, since they do not assume control over the outcomes. Those who are

internals, however, display higher levels of intrinsic motivation when they succeed, but decreased levels when they do not (Reeve, Olson, & Cole, 1987).

A third study relating the effects of competition in an education environment looked at the impact of goal structures on motivation (Clinkenbeard, 1989). Competitive goal structures correspond to the motivational state of ego involvement. When a student is ego-involved, learning is viewed as a means to an end where feelings of competence involve beating others. In contrast, an individualistic goal structure lead to a state of task involvement, where learning was viewed as an end in itself and the student felt competent just by showing improvements in his or her performance. The study also found that competition results in minimum effort, just enough to make an A on a test, while those students with individualistic goal structures were more likely to expend more effort in order to learn more and increase personal intellectual development (Clinkenbeard, 1989).

Fulop (2002), states that social comparison is the foundation of competitive processes. She writes that this is a strong occurrence in educational settings since in a typical classroom setting, the very presence of the other students fosters a competitive attitude to be better than everyone else. This comparative process occurs in three stages. The first stage is mainly a nonverbal process and involves evaluating ourselves by comparing our own developments and successes to the achievements of others. This is followed by the second stage, which is an evaluative process, where the student compares their strengths and weaknesses to those around him. Finally, the third stage is motivational, where the student will act on the results of this comparison to try to out-perform the other student or students that have been seen as competitors.

Research has shown that information about the opponent in a competitive situation can cause a person to form expectancies about the outcome of the competition before it even begins. If a person is made to believe that the opponent is not as skilled as he or she is, a positive expectancy on performance will result in a greater level of confidence about the chances of winning, while a more skilled opponent will have the opposite effect (Epstein & Harackiewicz, 1992).

Students will choose the "comparative other" based on how they feel about their own abilities (Fulop, 2002). They will divide the other students in the room into groups that they believe show similar, better, or worse performance then they do, and will choose from among these groupings the persons to compare themselves to. If self-evaluation is desired, the student will choose someone from the group that he or she feels performs equally in what aspect is being compared. This allows the most objective comparison to take place. If self-improvement is the goal, the student will compare himself or herself to someone they view as better then they are at the chosen skill, which can motivate them to work harder. This is called upward comparison. The opposite of this is a student who feels threatened by self-comparison, and to avoid that, selects another person who they feel is less skilled in the target area. This is called downward comparison, and is done to provide a student with low self-esteem a better view of his or her own abilities (Covington & Omelich, 1984; Fulop, 2002).

While it is true that one of the biggest factors that leads to competition among students in an educational environment is intellectual ability, other issues that lead to competition in the classroom is differences in socioeconomic status and competitive norms exhibited by the child's family. These factors taken together make the job of the teacher more difficult as they must

structure the learning environment to make all students appear equal by eliminating focus on those issues that may cause competitive attitudes to become apparent (Fulop, 2002).

From the perspective of cognitive evaluation theory, the main objective in the classroom is to maintain children's intrinsic motivation to learn. But as has already been discussed, the classroom environment is set up for competitive attitudes to be shown between children, and the structure for monitoring progress through learning by giving grades only increases this effect. This is because the grades are seen as controlling, since they provide feedback, which when negative, works to undermine intrinsic motivation (Deci, Koestner, & Ryan, 2001). Being able to see where one ranks with respect to others on performance of a task, such as an examination given in school, can lead a child to view their self-worth by their score on the test (Covington & Omelich, 1984; Deci & Ryan, 1985).

Competition in the Workplace

Work motivation is defined as the set of internal and external forces that initiate work-related behavior to determine its form, direction, intensity, and duration (Ambrose & Kulik, 1999). Many theories of motivation have been used in an attempt to explain what motivates people to work. Some of the earliest research centered on motives and needs, such as the need for achievement and the Protestant Work Ethic, which represents how much importance an individual places on his or her job (Weber, 1958). Equity theory examines how employees respond to situations in which they are treated more or less favorably than their co-workers (Adams, 1965; Enzle & Ross, 1978). These comparisons create a sense of tension, and the individual will make changes to his or her behavior to relieve this tension to re-establish equity.

Goal-setting theory explains how employees respond to goals set by their employer, whether they will increase or decrease effort depending on if the goal is perceived to be difficult or easy to obtain, and the feedback that is given related to performance toward completion of that goal (Locke & Latham, 1990). Finally, motivation to work began to be studied using the principles of cognitive evaluation theory as a guideline to understanding employee performance on the job by looking at the factors that affect intrinsic motivation (Ambrose & Kulik, 1999).

Several factors inherent in the workplace have been studied to examine their impact on intrinsic motivation. One of these is surveillance (Wild, Enzle, Nix, & Deci, 1997). When a worker is being monitored while doing his or her job, two interpretations can be formed based on how the situation is perceived by the employee. If the person being monitored views the observer as someone who is evaluating them, this would be interpreted by the worker as a controlling situation and would result in a reduction of intrinsic motivation toward the task. However, if the observer is seen as non-threatening to the employee, who is watching only because of personal interest in what was being done, the situation would be viewed as informational, and may actually improve intrinsic motivation as predicted by cognitive evaluation theory (Wild, Enzle, Nix, & Deci, 1997).

A second factor is monetary rewards, which in the workplace take the form of cash bonuses for superior performance (Ambrose & Kulik, 1999). This has the same effect on intrinsic motivation as any other type of tangible reward, in that it also can be interpreted two ways based which aspects of the situation seem most salient to the recipient as discussed in the section on cognitive evaluation theory. If someone sees the reward as an attempt to control his or her behavior, motivation will be reduced, but if the reward is seen as an indicator of competence on the job, intrinsic motivation will increase.

A third factor is imposed pressure on performance (Amabile, DeJong, & Lepper, 1976). This is most often seen in the workplace as deadlines to complete a job by a certain date. A study was designed to examine how deadlines affected future performance, quality of work, and whether a person placed in these conditions would be motivated to participate in this activity again later. In this experiment, participants were randomly placed in a no-deadline condition, where they were able to take as long as desired to complete a word game, or one of two deadline conditions where there was a 15-minute time limit imposed. In the explicit deadline condition, subjects were told that they were required to complete the game in the time allotted or their data would not be useful, while in the implicit deadline condition, no further instructions were given other than for the participants to work as quickly as possible. Following completion of the game, measures of intrinsic interest and future desire to participate in a similar activity were collected. The results of this study found that deadlines act as a control and led to a reduction in intrinsic motivation as well as a reduced tendency to want to participate in a similar activity again in the future (Amabile, DeJong, & Lepper, 1976).

Much research in the area of intrinsic motivation and the work environment has focused on how creativity of employees is affected by changes in motivation (Amabile, 1997). People are most creative when they feel motivated by the interest, satisfaction, and challenge found in the job they do, not by the incentives received for doing it (Beswick, 2002). As the studies mentioned above show, pressure from either being supervised while working or from imposed time constraints, such as deadlines, also lead to reduced intrinsic motivation for people. These three combined factors result not only in reduced creativity, but in lower task performance as well (Amabile, 1997).

The Present Study

Intrinsic motivation or the desire to participate in an activity for its enjoyment, without regard to any outside influences is seen as one of the most powerful forms of motivation, since it originates within the person. Countless hours of research have been done to try to determine what factors influence intrinsic motivation, and especially what can be done to improve it. One thing that has been shown to be detrimental to intrinsic motivation is competition. Studies have been done in many settings and with all age groups and consistent results have been obtained under these various conditions. The three areas concentrated on here were sports activities, education, and the workplace, and the studies cited all come to a common conclusion that competition negatively affects intrinsic motivation.

A second area of concern is pressure from external sources, either from other people or from time pressures, as is common in many working environments. Surveillance of employees, deadlines, and pressures from upper management all work against employee motivation toward his/her job. While the effect of this on intrinsic motivation has not been as extensively studied as competition has, these studies have consistently shown pressure to be a factor that leads to a decrease in intrinsic motivation and overall performance of employees, both in their creative abilities and task performance.

The present study aims to combine these two factors, while participants are engaged in a visual scanning task. The expected outcome of this study is to see a reduction in participants' intrinsic motivation under both conditions, as compared to a control group, and an even greater reduction of intrinsic motivation is expected as an interaction between these two factors. These findings are expected to support the predictions made by the cognitive evaluation theory.

Hypotheses

The following four hypotheses will be tested:

1. There will be a main effect for the competition variable; such that participants in the competition groups (both direct and indirect) will score significantly lower on intrinsic motivation than those people in the control group.
2. There will be a main effect for the pressure variable, such that participants in the pressure condition will show significantly lower task performance, and will score significantly lower on intrinsic motivation than those in the non-pressure group.
3. There will be an effect of winning, such that the winners in both the direct competition condition and the indirect competition condition will report higher levels of intrinsic motivation than losers.
4. There will be an interaction, such that those participants in both the direct competition group and the indirect competition group crossed with the pressure variable, will score significantly lower on intrinsic motivation and show significantly lower task performance than those participants in the competition only conditions (both direct and indirect), the pressure only condition, and the control group.

Method

Participants

180 volunteers were recruited from the student population at Embry-Riddle Aeronautical University in Daytona Beach, Florida to participate in this study. They were offered extra credit for completing the study. The group consisted of 126 males and 54 females, ranging in age from

18 to 49 (mean 21.69). A sign-up sheet was provided to the undergraduate students enrolled in several psychology and human factors classes, which allowed the students to volunteer for a time that was most convenient for them to participate. Each volunteer provided their name, telephone number, and electronic mail (Email) address, which were used by the experimenter to contact each person one day before testing to remind them of the appointed time and place to show up for the experiment.

Materials and apparatus

Testing was performed in a large study room located in the Hunt Memorial Library, which consisted of a table surrounded by 12 chairs in a well-lighted, air-conditioned environment. A chalkboard was located at the front of the room. Each participant was given a numbered manila folder upon entering the room, which consisted of all materials that would be needed during the experiment. Included in the folder were the consent form, participant survey, the grid concentration exercise sheet, and a modified version of the Intrinsic Motivation Inventory. Each of these materials was printed on standard white paper.

Participant survey

The survey consisted of four questions. Volunteers were asked to provide age, gender, GPA, and degree program. This information was collected for classification purposes only and confidentiality was ensured for all information provided during the experiment.

Grid Concentration Exercise

The grid concentration exercise consists of 10 rows and 10 columns of numbers ranging from 00 to 99. It is done by marking off consecutive numbers beginning with 00 and going in sequence, drawing a single line through each number until 99 is reached. It is used mainly to train athletes to increase their concentration before competing. Harris and Harris (1984), report that people who reach the high twenties to low thirties within a one-minute period have high levels of concentration.

Intrinsic Motivation Inventory

The post-experimental Intrinsic Motivation Inventory consists of 45 items divided into 7 subscales. These are interest/enjoyment, perceived competence, effort/importance, pressure/tension, perceived choice, value/usefulness, and relatedness. It is intended to assess participants' subjective experience related to a target activity in laboratory settings. Responses are indicated by circling the number on a 7-point likert scale that most closely corresponds to how the participant feels about each question. The scale ranges from 1-not at all true to 7-very true. This particular inventory is used because it can be easily modified to fit a variety of testing situations, and subscales that are irrelevant to your study can be eliminated. For the present study, a version of the Intrinsic Motivation Inventory developed and tested by McAuley, Duncan, & Tammen, (1989), was used. It is an 18-item inventory made up of questions from only the first four subscales. The first three subscales (interest/enjoyment, perceived competence, and effort/importance) will be used to measure changes in intrinsic motivation. The

fourth subscale (tension/pressure) is an extrinsic factor and will be used as a manipulation check to ensure that the pressure variable was effective.

Design

The design for this experiment is a 3 X 2, fully factorial, mixed design. Factor A is made up of three levels of competition, (direct, indirect, and no competition), and factor B is made up of two levels (pressure, and no pressure). In the direct competition situation, the participants will be told that they must complete as much of the grid concentration exercise as they can in 5 minutes, and that the person who gets the farthest will be the "winner" and will receive a prize. In the indirect competition condition, participants will not be competing against each other, but against a standard (most people are able to reach 50 in 5 minutes). The no competition condition serves as the control group.

Pressure will be manipulated by emphasizing the passage of time throughout the test. This will be done in two ways. First, a ticking clock will be placed in the front of the room and will be a constant reminder that time is running out. Second, participants will be notified every time 30 seconds has passed, allowing them to be constantly aware of how much time is remaining to either get as many numbers marked off as they can in an effort to beat the other students (direct competition) or to meet the stated goal of 50 in 5 minutes (indirect competition). Those in the no pressure condition will only be instructed when to start and stop, without being reminded of the time remaining for the test.

The independent variables for this study are level of competition (direct, indirect, or none), and pressure to complete the task (pressure, no pressure). This creates six experimental

conditions. The dependent variables will be highest number completed by each participant and the responses to the Intrinsic Motivation Inventory.

Before beginning the study, 10 people were randomly selected around campus and asked to complete the grid concentration exercise. The mean age for this sample was 26.10, and the mean time to complete the test was 12:37. This data was used to make sure that enough time was provided for the indirect competition situation so the participants would have an accurate number to try to reach given the amount of time provided. If the level was set too high, participants might have given up once they realized that this level of performance was unattainable. This initial testing was done to prevent this from occurring.

Procedure

Students were recruited about one week before the beginning of testing by passing out sign-up sheets (Appendix A) to students enrolled in several undergraduate psychology and human factors classes. Amount of extra credit that would be given for completing the study was specified prior at the time the sign-up sheets were made available. As mentioned earlier, students were asked to provide a phone number and Email address to enable the experimenter to remind them of the time and location one day before their scheduled date for testing.

Upon arrival, students were given a numbered manila folder containing all materials to be used during the experiment and asked to take a seat in the room, keeping an empty chair on all sides. This spacing was done to ensure that each person's answers could not be seen by anyone else to maintain confidentiality, as well as to eliminate any discussion about the experiment between the participants during the testing. Once everyone was seated, the consent form (Appendix B) was read aloud by the experimenter, which gave general instructions for the study,

reminded the students that they were free to leave the experiment at any time, and that all information collected would be kept confidential at all times. Once the consent form was read and signed, the participants were asked to complete a four-item questionnaire (Appendix C), which asked age, gender, GPA, and degree program. All forms used in the study were numbered to make sure that they were not mixed up with those of the other participants.

Next, participants were given instructions concerning the grid concentration exercise, which consisted of a sample drawn on the board containing the letters A through I in a 3 row by 3-column grid. This was done only to ensure that everyone understood how he or she should mark the test with a single line drawn through each letter to maintain consistency across groups. Letters are used instead of numbers in this example to avoid a practice effect. Students were instructed that the grid may consist of numbers or letters, so that either case would be expected, even though the grid is the same across all groups.

Then the experimenter read a script written specifically for that experimental group (type of competition involved and pressure condition, if any) to set the stage and get everyone prepared for the test. This also was done to ensure consistency across groups since only two to five students were tested at a time, requiring several groups to be run in each condition. They were then asked to remove the test from the folder and begin. Time was monitored with a stopwatch. Once the allotted time had passed, participants were asked to turn their paper over and write the highest number crossed off on the back of the sheet. For the direct and indirect competition conditions, the person with the highest number was awarded a candy bar. For all other conditions, it allowed comparison of scores to see how each person had done relative to everyone else, but no reward was specified, other than the extra credit for participation in the study.

Finally, the participants were asked to remove the Intrinsic Motivation Inventory from the folder and complete it by selecting a number from one to seven that corresponded to how they felt about each item. These materials were then collected; the participants were thanked again for their time and dismissed.

Pilot Study

Before the experiment was conducted, the first 10 students that signed up were used to conduct a pilot study to test whether the grid concentration exercise was in fact an activity that was considered to be both an enjoyable and challenging task to college students, which is required for a study dealing with intrinsic motivation. This sample consisted of 8 males and 2 females, with a mean age of 21.10. These students were tested in the same manner as the control group, in that they provided informed consent and completed the initial questionnaire. They were then given the grid concentration exercise and had five minutes to mark off as many numbers as they could, being instructed only when to start and stop the test. Once this was done, they filled out the intrinsic motivation inventory. The results of this pilot study are shown in Table 1. As can be seen here, these students rated an overall mean of 5.28 on the interest/enjoyment subscale, showing that it was indeed an interesting task, and the perceived difficulty is evident in the score of 5.65 reported on the effort/importance subscale.

Table 1.

Results of Pilot Study Testing the Grid Concentration Exercise

Mean Score	Interest/Enjoyment Subscale	Perceived Competence Subscale	Effort/Importance Subscale	Pressure/Tension Subscale
42.50	5.28	4.22	5.65	4.38

Results

Performance

A between-subjects ANOVA was used to test the overall model depicting the effect of competition and time pressure on performance of the grid concentration exercise, and results indicate that this model was not significant, $F(5,174) = .70$, $p = .63$. In addition, both main effects and the interaction were not significant, $F(1,174) = 1.97$, $p = .162$ (for pressure), $F(2,174) = .25$, $p = .78$ (for competition), and $F(2,174), = .51$, $p = .60$ (interaction). For pressure, the observed power was .29 and the effect size was .01. For competition, power was .09, with an effect size of .00. Refer to Table 2 for the source table, and Table 3 for means and standard deviations for both variables. Figure 1 provides a visual representation of the results.

Table 2.

Analysis of Variance for Performance on the Grid Concentration Exercise

Source	*df*	F	Sig.	Partial Eta Squared	Observed Power
Corrected Model	5	.698	.626	.020	.248
Pressure	1	1.974	.162	.011	.287
Competition	2	.248	.781	.003	.088
Interaction	2	.511	.601	.006	.133
Error	174				

Table 3.

Means and Standard Deviations for Performance on the Grid Concentration Exercise

Pressure	Competition	Mean	Std. Deviation
PRESSURE	NONE	41.87	9.4
	INDIRECT	39.80	8.4
	DIRECT	41.20	8.0
NO PRESSURE	NONE	43.27	10.2
	INDIRECT	43.57	9.5
	DIRECT	41.73	8.7

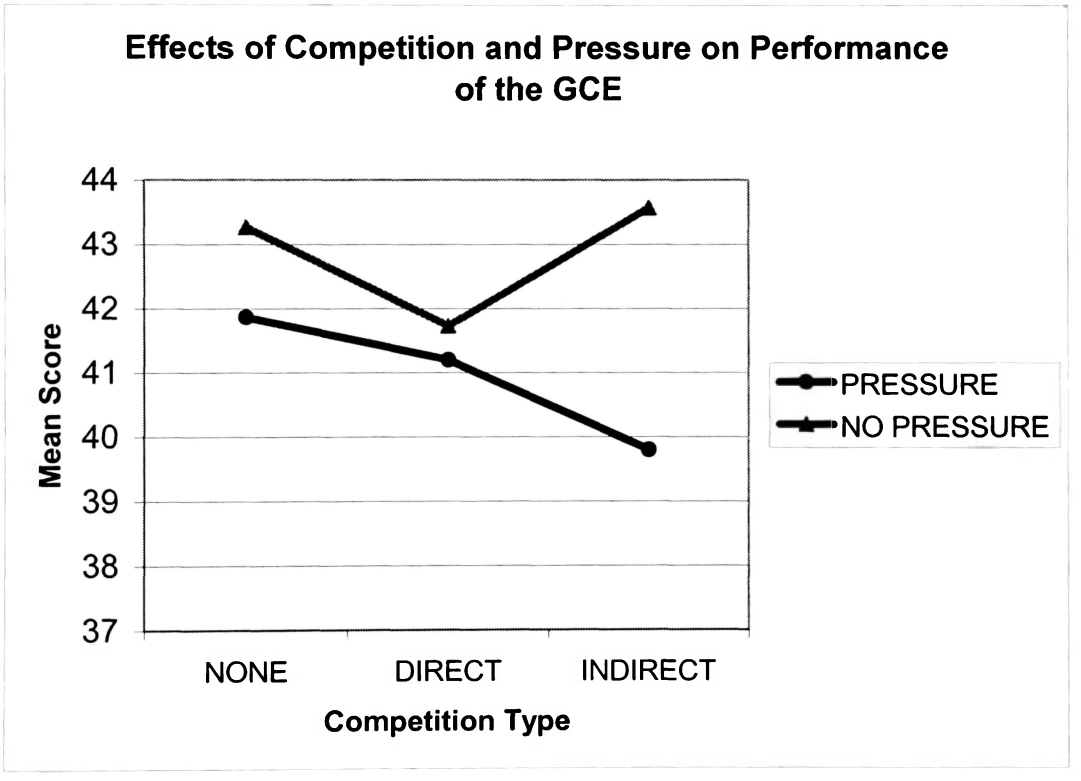

Figure 1. Graph showing the effect of pressure on performance of the grid concentration exercise.

Intrinsic Motivation Inventory Responses

Four separate analyses were run (one for each of the four scales of the Intrinsic Motivation Inventory on which data was collected) to test the hypothesis that competition and pressure would negatively affect intrinsic motivation of the participants. Table 4 lists the means and standard deviations, and Figures 2 through 5 are visual representations of these results.

Interest/Enjoyment Subscale. The model testing interest/enjoyment was not significant, $F(5,174) = 1.0, p = .41$. Observed power was .36 with an effect size of .03.

Perceived Competence Subscale. The model testing perceived competence was not significant, $F(5,174) = .42, p = .83$. Observed power was .16 with an effect size of .01.

Effort/Importance Subscale. The model testing effort/importance was not significant, $F(5,174) = 1.9, p = .10$. Observed power was .63 with an effect size of .05.

Pressure/Tension Subscale. The model testing pressure/tension was not significant, $F(5,174) = .38, p = .86$. Observed power was .15 with an effect size of .01

Table 4.

Means and Standard Deviations for Responses on the Intrinsic Motivation Inventory

		Interest/Enjoyment		Perceived Competence		Effort/Importance		Pressure/Tension	
Pressure	Competition	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
PRESSURE	NONE	4.85	1.0	4.41	1.1	5.32	1.1	4.13	1.4
	INDIRECT	4.96	0.7	4.32	1.0	4.96	1.2	4.30	1.2
	DIRECT	5.02	1.2	4.33	1.4	5.43	1.0	4.56	1.4
NO PRESSURE	NONE	5.37	0.9	4.61	1.1	5.73	0.8	4.27	1.4
	INDIRECT	4.95	1.1	4.62	1.2	5.43	1.0	4.43	1.6
	DIRECT	5.09	1.0	4.53	1.1	5.46	1.0	4.19	1.5

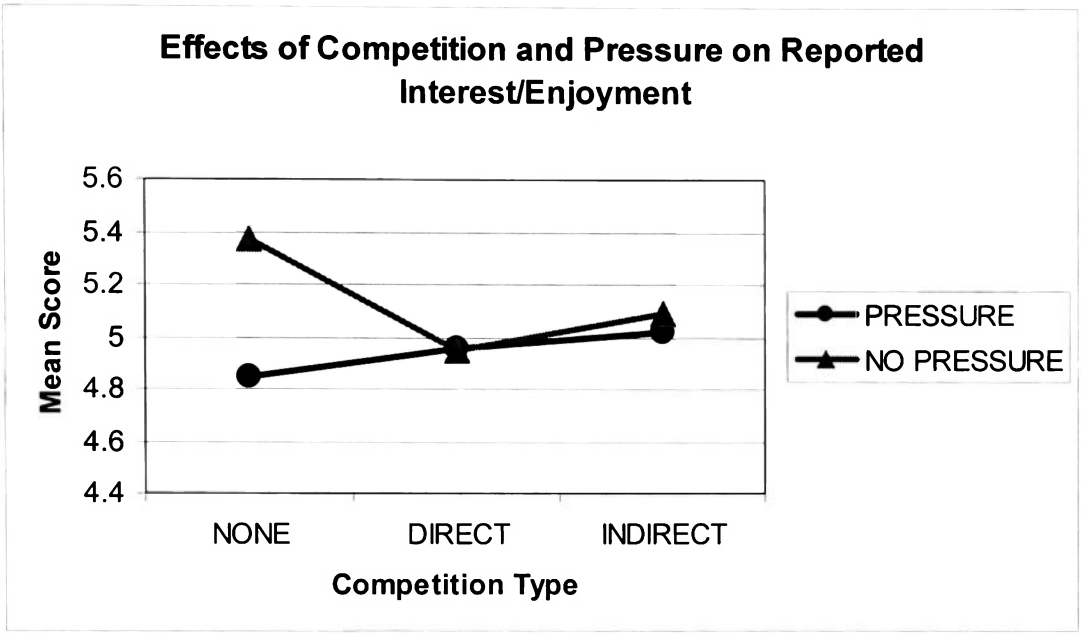

Figure 2. Graph showing the effects of competition and pressure on reported interest/enjoyment.

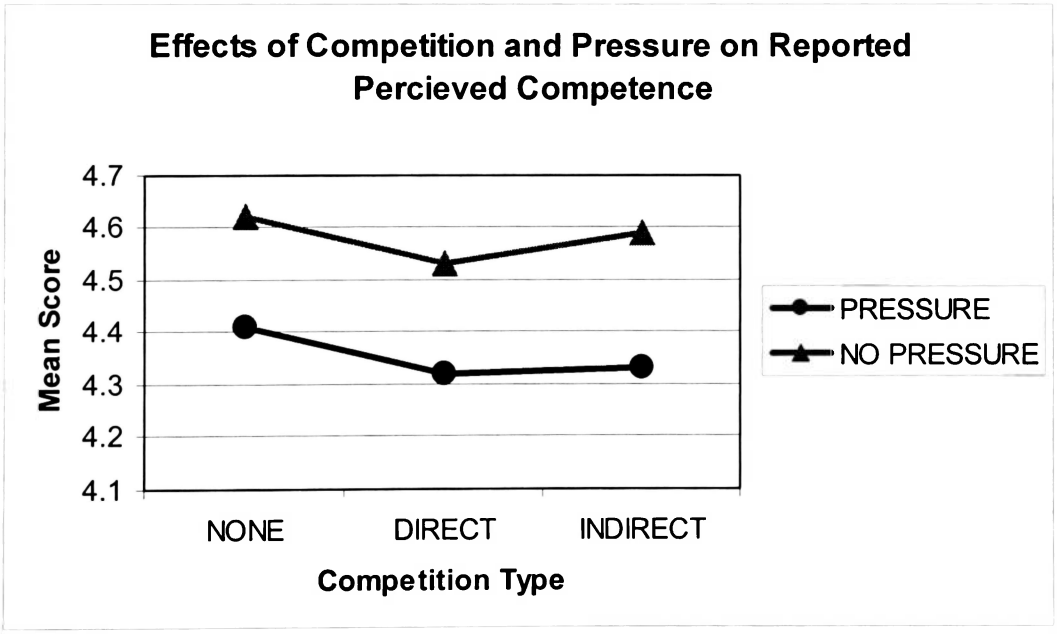

Figure 3. Graph showing the effects of competition and pressure on reported perceived competence.

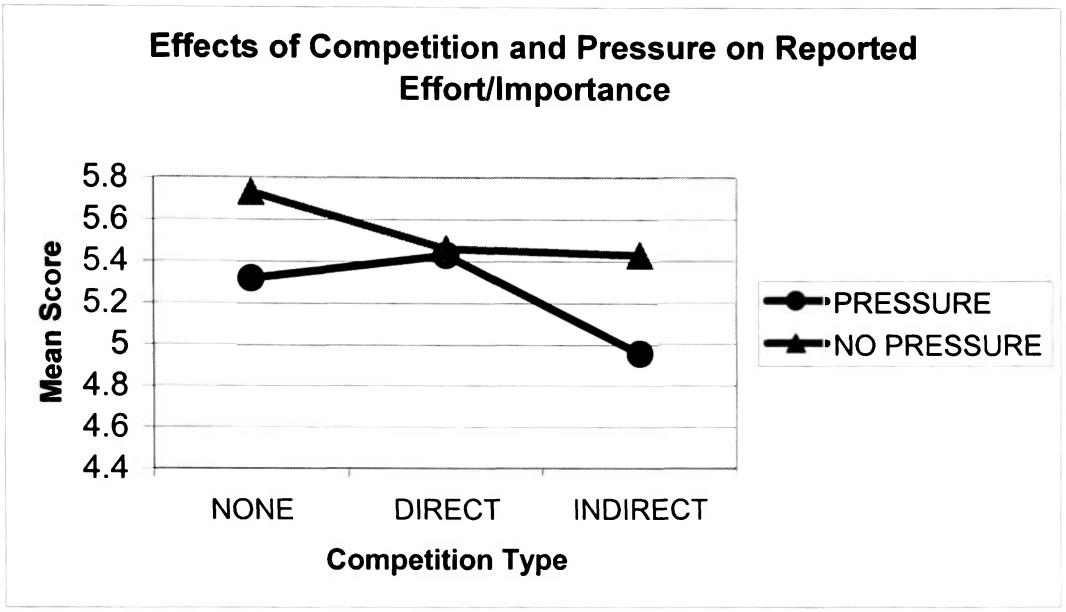

Figure 4. Graph showing the effects of competition and pressure on reported effort/importance.

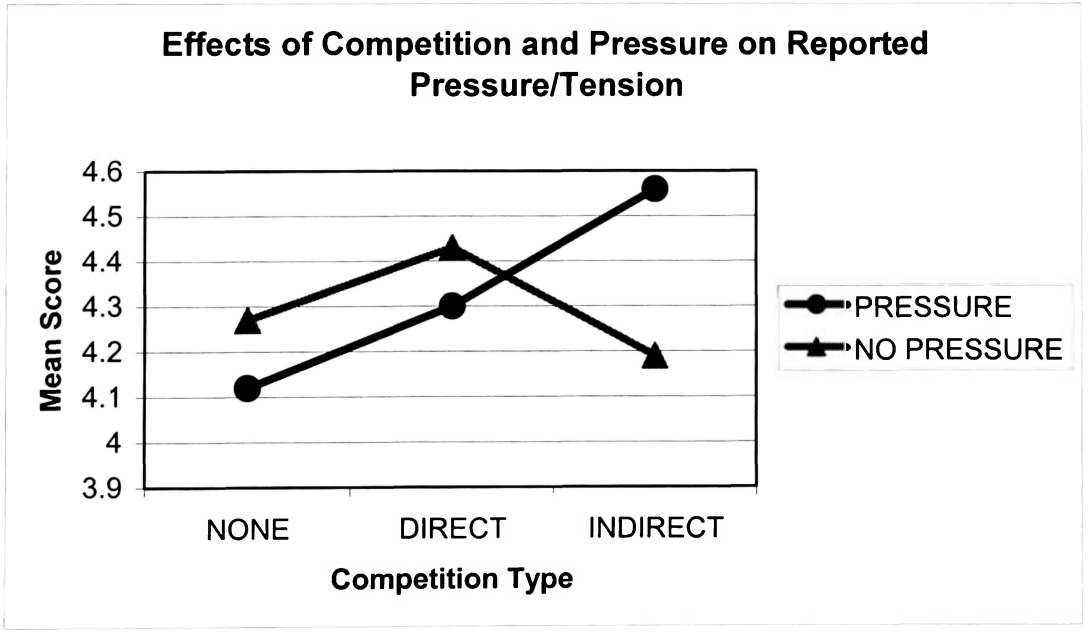

Figure 5. Graph showing the effects of competition and pressure on reported pressure/tension.

Winning versus Losing

Across all competition conditions, the winners achieved a mean score for performance on the grid concentration exercise of 48.03, while the mean score of those who lost was 38.35. Four analyses were run to test hypothesis 3, which predicted that winners would score higher in intrinsic factors due to the positive feedback obtained due to superior performance on the grid concentration exercise as compared to the other students in the room who lost the competition. Results examining the variable of interest/enjoyment were significant, $F(1,119) = 4.72$, $p = .03$. Winning was also significantly related to perceived competence, $F(1,119) = 42.96$, $p = .00$. Winning was not related to effort/importance, $F(1,119) = 1.09$, $p = .30$. The pressure/tension subscale was used as a measure of extrinsic motivation and was not significantly related to winning, $F(1,119) = .47$, $p = .49$. Table 5 presents the source tables for these analyses, and Table 6 summarizes the means and standard deviations for each of the four subscales of the Intrinsic Motivation Inventory. Figures 6-9 are visual representations of these results.

Table 5.

Analysis of Variance for Win/Loss by Subscale Response

		df	F	Sig.
Interest/Enjoyment	Between Groups	1	4.721	.032
	Within Groups	118		
	Total	119		
Perceived Competence	Between Groups	1	42.962	.000
	Within Groups	118		
	Total	119		
Effort/Importance	Between Groups	1	1.091	.298
	Within Groups	118		
	Total	119		
Pressure/Tension	Between Groups	1	.471	.494
	Within Groups	118		
	Total	119		

Table 6.

Means and Standard Deviations for Win/Loss by Subscale Response

	Interest/Enjoyment		Perceived Competence		Effort/Importance		Pressure/Tension	
Outcome	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
WIN	5.28	0.8	5.31	0.9	5.46	1.0	4.49	1.7
LOSS	4.87	1.0	4.02	1.1	5.25	1.0	4.31	1.3

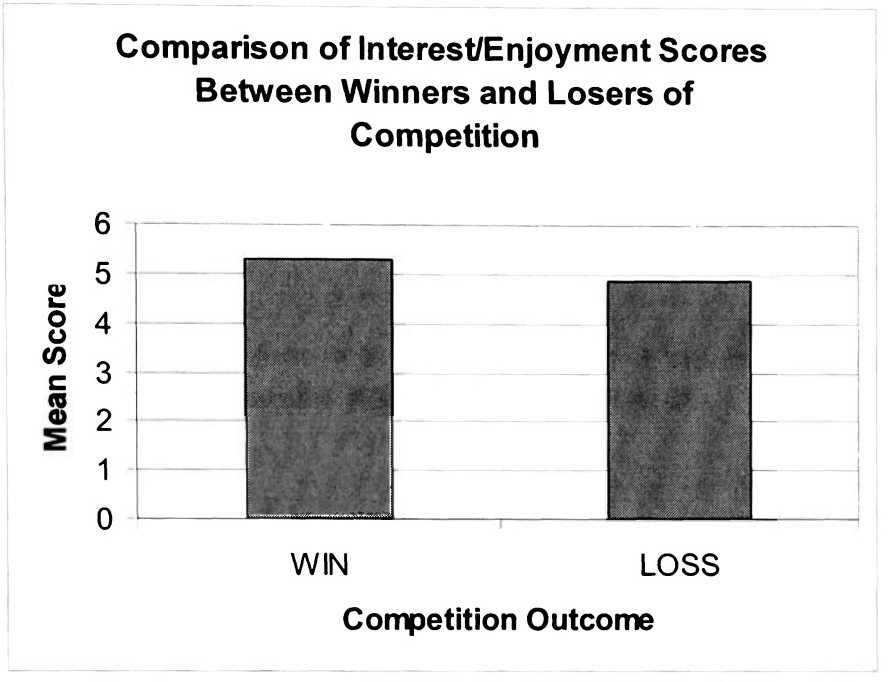

Figure 6. Graph showing the effects of winning versus losing on reported interest/enjoyment.

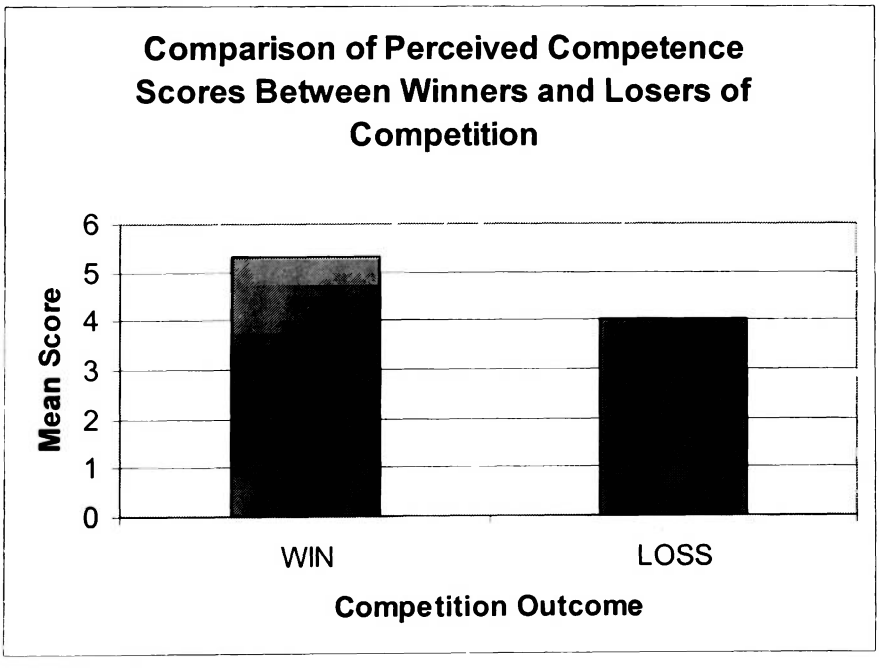

Figure 7. Graph showing the effects of winning versus losing on reported perceived competence.

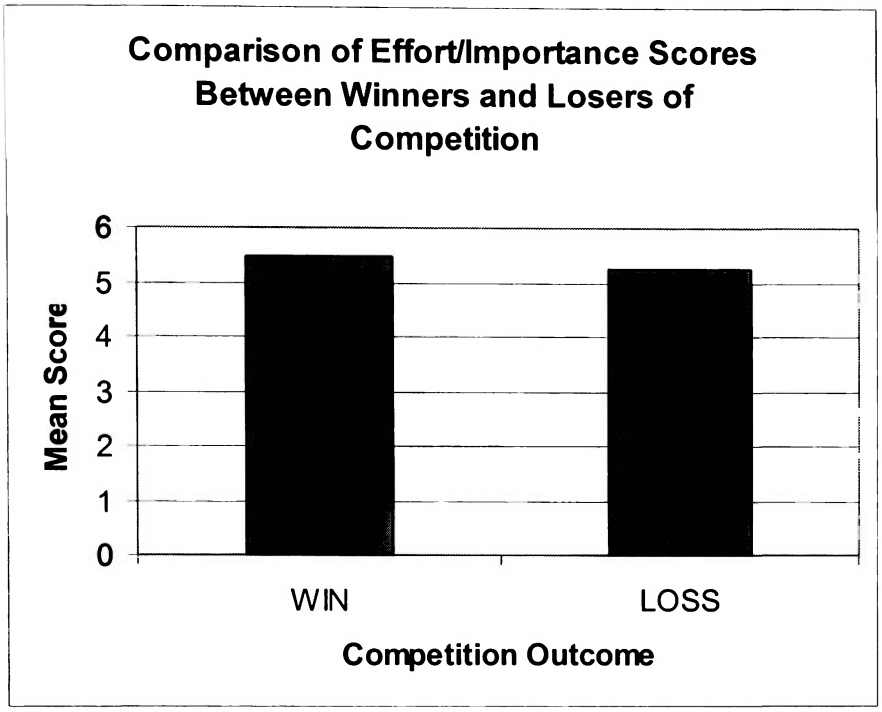

Figure 8. Graph showing the effects of winning versus losing on reported effort/importance.

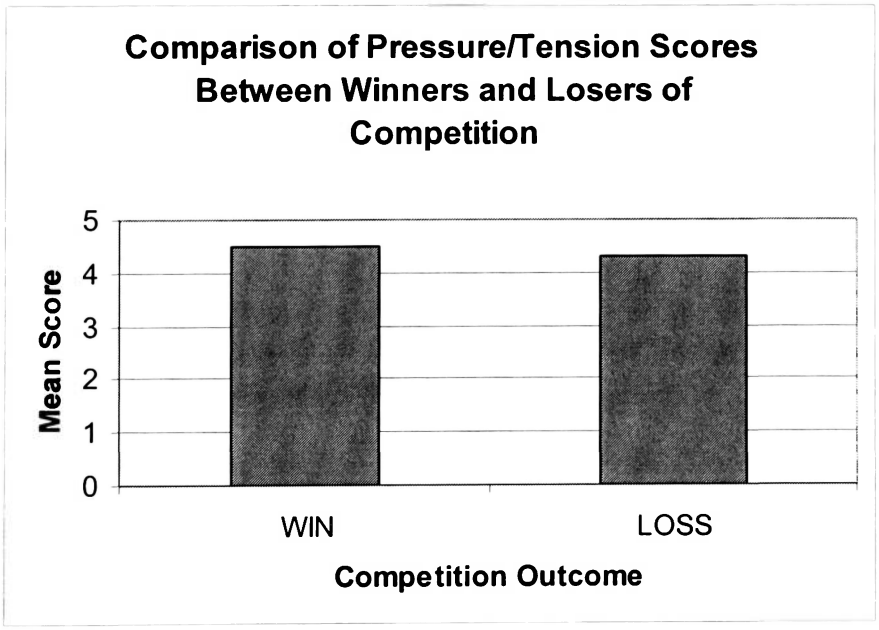

Figure 9. Graph showing the effects of winning versus losing on reported pressure/tension.

Discussion

The present study examined the effects of competition and perceived time pressure on performance of a visual scanning task called the grid concentration exercise, which has been used by sports psychologists to help train athletes to focus while competing (Harris & Harris, 1984). Performance was measured as the highest number crossed off in a five-minute period. The Intrinsic Motivation Inventory was used as a post-test measure of intrinsic motivation, with data being collected on the first four subscales; interest/enjoyment, perceived competence, effort/importance, and pressure/tension. The first three subscales measured intrinsic interest, while the latter was used as a manipulation check, and was a measure of extrinsic motivation. The results were expected to support cognitive evaluation theory.

It was hypothesized that those participants who were in competition (both direct and indirect) would score lower on the grid concentration exercise and report lower intrinsic motivation than those people in the control group because they would be more focused on the outcome (winning or losing). Results of this study indicate that this hypothesis was not supported. While participants who were in the no pressure condition did score slightly higher on the grid concentration exercise overall than those in the pressure condition (refer to Figure 1), the difference was quite small, with those in the indirect competition, no pressure condition having the best mean performance of 43.57 while those in the indirect competition, pressure condition had the lowest mean performance of 39.80.

Concerning reported intrinsic interest in the task, it was true that the participants in the control group did report higher scores overall on the three subscales measuring intrinsic motivation than those students in any of the competition conditions (refer to figures 2-4), but once again the differences were very small, and not statistically significant.

Second, time pressure was expected to significantly affect performance compared to the non-pressured group. The imposed deadline monitored by a loud timer would act as an external motivator, as well as interruptions by the experimenter reminding participants of the deadline were hypothesized to decrease the ability of the participants to concentrate on the task. Results indicated that this hypothesis was not supported. As mentioned earlier, the group with the worst performance was the indirect competition/pressure group. However, even those people in the control group reported that they were pressured while completing the task as evident in the scores for the pressure/tension subscale on the Intrinsic Motivation Inventory (refer to Table 4).

In addition, it was expected that the combined direct competition/pressure group would show the greatest detriment in performance and intrinsic motivation as compared to all other groups. Again, this hypothesis was not supported. This group received a mean score of 41.20 on the grid concentration exercise, and reported relatively high scores on the three scales of the Intrinsic Motivation Inventory. They did, however, report the highest pressure/tension score on the IMI relative to all other groups, which means that while they found the task intrinsically motivating, they were pressured by the possibility of losing, as indicated by these scores as compared to the other competition conditions. It must be emphasized that these results were not statistically significant.

There are two possible explanations for the results found in this study. The first is that the pressure manipulation was not strong enough to influence performance and reported intrinsic interest in the task. Based on the studies collected in the literature review, this is probably not the case. A more probable explanation is that while cognitive evaluation theory has been supported by numerous studies, current research has shown that it may not be valid in certain situations, especially those where competition is an expected element (Frederick-Recascino,

2003). The aviation industry is a highly competitive one by nature, where wrong decisions can lead to serious accidents and loss of life. It is possible that students at Embry-Riddle Aeronautical University consider competitive and pressure-filled activities to be part of the norm, and have adapted to deal with this type of environment as compared to students enrolled in more traditional colleges and universities.

One way to examine this possibility is to look at scores on the grid concentration exercise and responses to the IMI as a function of age of participant. The reasoning here being that those students who are older have been enrolled longer, having more time to acclimate to the environment here at Embry-Riddle. These correlations were significant for the interest/enjoyment subscale, which lends support to this argument. One area for future research would be to test incoming freshmen and compare those results to a sample of upperclassmen to see if there is indeed an effect of exposure to high pressure/highly competitive environments on intrinsic motivation.

Finally, it was expected that winners would report higher intrinsic motivation than losers due to positive feedback related to competence on the task. Of the three scales measuring intrinsic interest, two were significant, interest/enjoyment and perceived competence (refer to Table 5).

It is interesting to note that overall, women performed better on the grid concentration exercise than the men did, reaching a mean score of 44.06 compared to 40.98 for the men in the sample. In addition, the women also reported higher scores on the three measures of intrinsic motivation than the men did. This finding is contradictory to Weinberg & Ragan, 1979, which stated that men displayed higher intrinsic motivation in competitive situations than women did. However, even though they performed better and enjoyed the task more, their responses to the

pressure/tension subscale were significantly higher than that of the men in the sample, so it seems that the pressure manipulation used in this study was effective with respect to the women, but not for the men.

Conclusion

Much research has been conducted to examine what factors influence intrinsic motivation. The purpose of this study was to examine Cognitive Evaluation Theory. Specifically, it was done to see how competition and time pressure affected performance on a simple visual scanning task, and the overall reported intrinsic motivation of the participants. While several studies have been done to examine these factors independently, the combined effect of these two parameters was not known.

While this study failed to replicate earlier findings, some interesting results were discovered. First, it appears that while this theory holds true under most situations where it has been tested, environmental factors may play a role. Further research is needed to see if this can be verified. Second, contradictory results were found concerning gender and competitive settings. This finding could be related to the first, in that women who are exposed to these environments become more accustomed to these factors and this is reflected in their responses on the Intrinsic Motivation Inventory.

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Appendix A
Participant Sign-up Sheet

Participant sign-up form

Date: _____

Name	Phone Number	Email Address

Date: _____

Name	Phone Number	Email Address

Date: _____

Name	Phone Number	Email Address

Appendix B
Consent Form

THE EFFECTS OF COMPETITION AND PERCEIVED PRESSURE ON PERFORMANCE OF A VISUAL SCANNING TASK: A TEST OF COGNITIVE EVALUATION THEORY

CONSENT FORM

Conducted by Tanya R. Adkins
Embry-Riddle Aeronautical University
Master of Science in Human Factors and Systems

The experiment in which you are about to participate will be investigating the effects of competition and time pressure on the performance of a visual scanning task. During the study, please follow all instructions given and do not talk to the other participants as any distractions may interfere with completion of the task.

This experiment should take about 30 minutes to complete. You are encouraged to ask any questions that you may have before testing begins. Please understand that you are free to withdraw from this study at any time. Your participation is greatly appreciated and you may receive extra credit points for participating in this study. Please check with your professor for the amount of credit you will receive.

You will be asked to complete an initial questionnaire, which is used for classification purposes only. Please understand that all information provided will be kept confidential. The test will consist of a concentration exercise, which is a grid made up of 10 columns and 10 rows. The numbers 00 through 99 are placed randomly inside the grid. Your task is to cross off the numbers in sequence beginning with 00 and continue until you are told to stop. At that time, please turn the paper over, and write the last number that you were able to cross off on the back. Finally, you will complete a modified version of the Intrinsic Motivation Inventory, which is a series of 18 questions about this activity. Please answer these questions by writing the response that describes how you feel about the task (ranging from 1-not at all true to 7-very true) in the space at the end of each question. Once finished, place all materials in the folder, which will then be collected by the experimenter. You will receive a written statement describing the results obtained once all data has been collected and analyzed. Please do not discuss this study with other people in your class since they might be in a different experimental condition and any prior knowledge could affect the results.

Your signature on this form means that you understand these instructions, and that you agree to voluntarily participate in this study. If you have any further questions concerning this experiment, please contact me at (386) 451-4446

_____ _____
Date Name (Please Print)

_____
Signature

_____
Experimenter

Appendix C
Initial Student Questionnaire

Participant Survey

Please answer each question. Remember that this information is for classification purposes only and will be kept confidential.

1. What is your age? _____
2. Are you: Male _____ Female _____
3. What is your current GPA? _____
4. What is your degree program? _____

Appendix D
Grid Concentration Exercise Form

GRID CONCENTRATION EXERCISE

Directions:

Beginning with 00, put a slash through each number in the proper sequence (00, 01, 02, 03, etc.) getting as many as you can in the time specified by the experimenter.

84	27	51	78	59	52	13	85	61	55
28	60	92	04	97	90	31	57	29	33
32	96	65	39	80	77	49	86	18	70
76	87	71	95	98	81	01	46	88	00
48	82	89	47	35	17	10	42	62	34
44	67	93	11	07	43	72	94	69	56
53	79	05	22	54	74	58	14	91	02
06	68	99	75	26	15	41	66	20	40
50	09	64	08	38	30	36	45	83	24
03	73	21	23	16	37	25	19	12	63

Appendix E
Intrinsic Motivation Inventory (7-scale version)

THE POST-EXPERIMENTAL INTRINSIC MOTIVATION INVENTORY
(Below are listed all 45 items that can be used depending on which are needed.)

For each of the following statements, please indicate how true it is for you, using the following scale:

1	2	3	4	5	6	7
not at all true			somewhat true			very true

Interest/Enjoyment

I enjoyed doing this activity very much
This activity was fun to do.
I thought this was a boring activity. (R)
This activity did not hold my attention at all. (R)
I would describe this activity as very interesting.
I thought this activity was quite enjoyable.
While I was doing this activity, I was thinking about how much I enjoyed it.

Perceived Competence
I think I am pretty good at this activity.
I think I did pretty well at this activity, compared to other students.
After working at this activity for a while, I felt pretty competent.
I am satisfied with my performance at this task.
I was pretty skilled at this activity.
This was an activity that I couldn't do very well. (R)

Effort/Importance
I put a lot of effort into this.
I didn't try very hard to do well at this activity. (R)
I tried very hard on this activity.
It was important to me to do well at this task.
I didn't put much energy into this. (R)

Pressure/Tension
I did not feel nervous at all while doing this. (R)
I felt very tense while doing this activity.
I was very relaxed in doing these. (R)
I was anxious while working on this task.
I felt pressured while doing these.

Perceived Choice
I believe I had some choice about doing this activity.
I felt like it was not my own choice to do this task. (R)
I didn't really have a choice about doing this task. (R)
I felt like I had to do this. (R)
I did this activity because I had no choice. (R)
I did this activity because I wanted to.
I did this activity because I had to. (R)

Value/Usefulness
I believe this activity could be of some value to me.
I think that doing this activity is useful for _____
I think this is important to do because it can _____
I would be willing to do this again because it has some value to me.
I think doing this activity could help me to _____
I believe doing this activity could be beneficial to me.
I think this is an important activity.

Relatedness
I felt really distant to this person. (R)
I really doubt that this person and I would ever be friends. (R)
I felt like I could really trust this person.
I'd like a chance to interact with this person more often.
I'd really prefer not to interact with this person in the future. (R)
I don't feel like I could really trust this person. (R)
It is likely that this person and I could become friends if we interacted a lot.
I feel close to this person.

Constructing the IMI for your study. First, decide which of the variables (factors) you want to use, based on what theoretical questions you are addressing. Then, use the items from those factors, randomly ordered. If you use the value/usefulness items, you will need to complete the three items as appropriate. In other words, if you were studying whether the person believes an activity is useful for improving concentration, or becoming a better basketball player, or whatever, then fill in the blanks with that information. If you do not want to refer to a particular outcome, then just truncate the items with its being useful, helpful, or important.

Appendix F
Intrinsic Motivation Inventory (Modified Version)

Intrinsic Motivation Inventory

For each of the following statements, please indicate how true it is for you, using the following scale:

1	2	3	4	5	6	7
not at all true			somewhat true			very true

1. I enjoyed doing this activity very much. _____
2. I think I am pretty good at this activity. _____
3. I put a lot of effort into this activity. _____
4. It was important for me to do well at this activity. _____
5. I felt tense while doing this activity. _____
6. I tried very hard on this activity. _____
7. This activity was fun to do. _____
8. I would describe this activity as very interesting. _____
9. I am satisfied with my performance on this task. _____
10. I felt pressured while doing this activity. _____
11. I was anxious while working on this task. _____
12. I didn't try very hard to do well at this activity. _____
13. While working on this activity, I was thinking about how much I enjoyed it. _____
14. After working at this activity for a while, I felt pretty competent. _____
15. I was very relaxed while doing this activity. _____
16. I was pretty skilled at this activity. _____
17. This activity did not hold my attention at all. _____
18. This was an activity that I couldn't do very well. _____

Scoring

Four items on this inventory are reverse scored. To do this, subtract the item response from 8 and use the resulting number as the item score. Then calculate subscale scores by averaging across all of the items on that subscale. The subscale scores are then used in the analyses of relevant questions.

For this modified version, items 12, 15, 17 and 18 are reverse scored.

The following items make up the interest/enjoyment subscale:

1, 7, 8, 13, and 17 (R)

The following items make up the perceived competence subscale:

2, 9, 14, 16, and 18 (R)

The following items make up the effort/importance subscale:

3, 4, 6, and 12 (R)

The following items make up the pressure/tension subscale:

5, 10, 11, and 15 (R)